

Presentation to the National Academy of Sciences
Committee on Strengthening Forensic Science
at the National Institute of Justice

April 1, 2015

NIST Panel Discussion

John M. Butler

NIST Fellow & Special Assistant to the Director for Forensic Science

Mark D. Stolorow

Director of OSAC Affairs



Presentation Plan

- John
 - NIST history with NIJ
 - Recent efforts with NCFS, OSAC, and research
- Mark (OSAC)
 - **Provided Questions 1-6**
- John (NCFS and research)
 - **Provided Questions 7-9**
- Q&A (~45 minutes)

NIST's Early History in Forensic Science Research

- **1913** - Wilmer Souder was asked to calibrate some precision measuring devices sent to him by famed handwriting expert Albert Osborn.
- By the 1930s – Souder was recognized as a pioneer researcher in questioned documents, handwriting, typewriting, ballistics, and firearms.
- Souder was instrumental in setting up the FBI Laboratory, which opened in 1932

NIST began work with fingerprints in the 1960s and with DNA in the 1990s



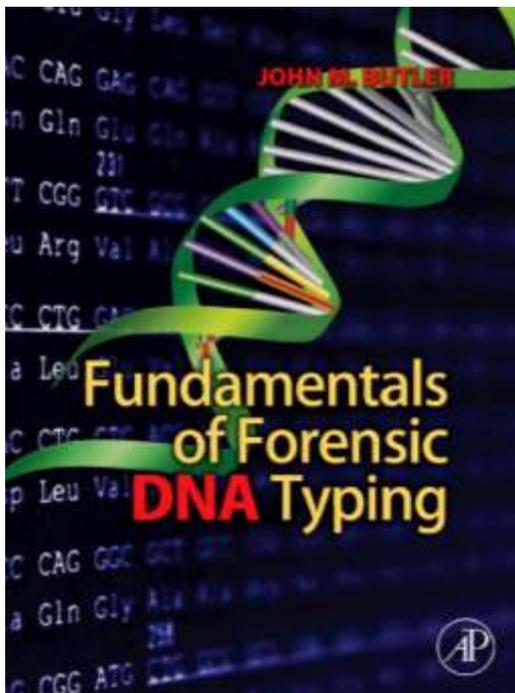
DR. WILMER SOUDER
Washington, D. C.

Brief History of the NIST Office of Law Enforcement Standards (OLES)

Year	Activity
1971	Law Enforcement Standards Laboratory (LESL) formed within the National Bureau of Standards (NBS), part of the U.S. Department of Commerce; Jacob Diamond is first director; fully funded by the National Institute of Law Enforcement and Criminal Justice (predecessor to NIJ)
1979	Lawrence Eliason becomes second director of LESL
1988	The name of NBS is changed to the National Institute of Standards and Technology (NIST)
1991	LESL becomes OLES within the NIST Electronics and Electrical Engineering Laboratory
1994	Kathy Higgins becomes the third director of OLES
2008	Mark Stolorow becomes the fourth director of OLES
2011	During NIST re-organization, OLES is moved under the Associate Director of Laboratory Programs and name is changed to the Law Enforcement Standards Office within the Special Programs Office (SPO); direct NIJ funding stopped; NIST forensic science research funded directly from Congress
2013	OLES formally dissolved and SPO Forensic Science Program formed

John Butler personal experiences with NIJ

- **1993-1995**: graduate student support for research conducted at FBI Laboratory Forensic Research Unit on capillary electrophoresis for DNA analysis (resulted in a 254-page dissertation that pioneered the method used around the world today); \$70k
- **1995-1997**: NIJ funds provided some assistance for development of the NIST website on DNA markers (STRBase)
- **1997-1999**: GeneTrace Systems (Alameda, CA) rapid DNA analysis using mass spectrometry (received 2 NIJ grants)
- **1999-2011**: supplemented forensic DNA reference material development and supported continued research and evaluation of forensic DNA methods and markers at a level of ~\$1M per year
- *Has assisted with NIJ research proposal reviews in the past (most recently in June 2012)*

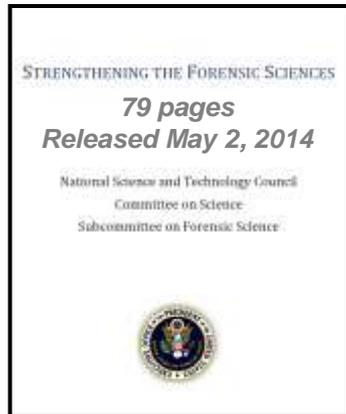
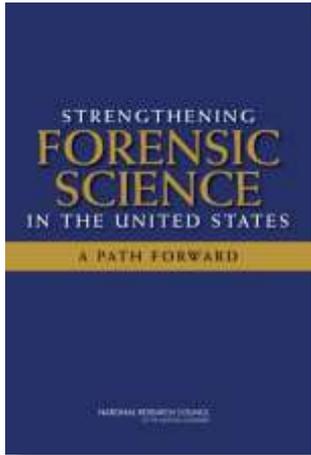


Opening Statement of my 2010 Book “Fundamentals of Forensic DNA Typing”

NIJ funding has supported almost all of my 150 publications and three of my five textbooks on DNA

This work was funded in part by the National Institute of Justice (NIJ) through interagency agreement 2008-DN-R-121 with the NIST Office of Law Enforcement Standards. Points of view in this document are those of the author and do not necessarily represent the official position or policies of the U.S. Department of Justice. Certain commercial equipment, instruments, and materials are identified in order to specify experimental procedures as completely as possible. In no case does such identification imply a recommendation or endorsement by the National Institute of Standards and Technology nor does it imply that any of the materials, instruments, or equipment identified are necessarily the best available for the purpose.

NCFS and OSAC: U.S. Efforts to Strengthen Forensic Science



http://www.whitehouse.gov/sites/default/files/microsites/ostp/NSTC/strengthening_the_forensic_sciences_may_-_2014.pdf

- National Academy of Sciences (**NAS**) **report** issued in Feb 2009
- White House **Subcommittee on Forensic Science** (SoFS) operated from July 2009 to Dec 2012

DOJ/NIST Partnership (announced Feb 2013)

1. **NCFS** (National Commission on Forensic Science)
 - First meeting held February 3-4, 2014 in Washington DC
2. **OSAC** (Organization of Scientific Area Committees)
 - 542 members named; first public meetings held in Feb 2015



Co-lead with DOJ

National Commission on Forensic Science

**NIST Point-of-Contact (POC):
John Butler**

A federal advisory committee for the U.S. Department of Justice

<http://www.justice.gov/ncfs>



Organization of Scientific Area Committees

POC: Mark Stolorow & John Paul Jones

NIST-administered effort dedicated to identifying and developing technically sound, consensus-based documentary standards and guidelines

<http://www.nist.gov/forensics/osac/>



NIST

Forensic

NIST Forensic Science Center of Excellence (to be awarded FY15)

Research Program

POC: Sue Ballou

SIX FOCUS AREAS

1. *Ballistics and Associated Tool Marks*
2. *Digital and Identification Forensics*
3. *Forensic Genetics*
4. *Toxins*
5. *Trace*
6. *Statistics*

<http://www.nist.gov/forensics>

Please explain how OSAC is structured, its purpose, goals, and expected outcomes?

- **Structure:** 1 governing board, 3 resource committees, 24 subcommittees organized into 5 scientific area committees
- **Purpose:** to provide quality standards and guidelines for the forensic science community
 - initial gathering of forensic standards and guidelines currently has **718 entries** (<http://www.nist.gov/forensics/osac/standards-guidelines-catalog.cfm>)
- **Goals:** implementation of quality standards and guidelines to strengthen the practice of forensic science, enforced by accreditation bodies
- **Expected outcomes:** to identify and develop technically sound, consensus-based documentary standards and guidelines

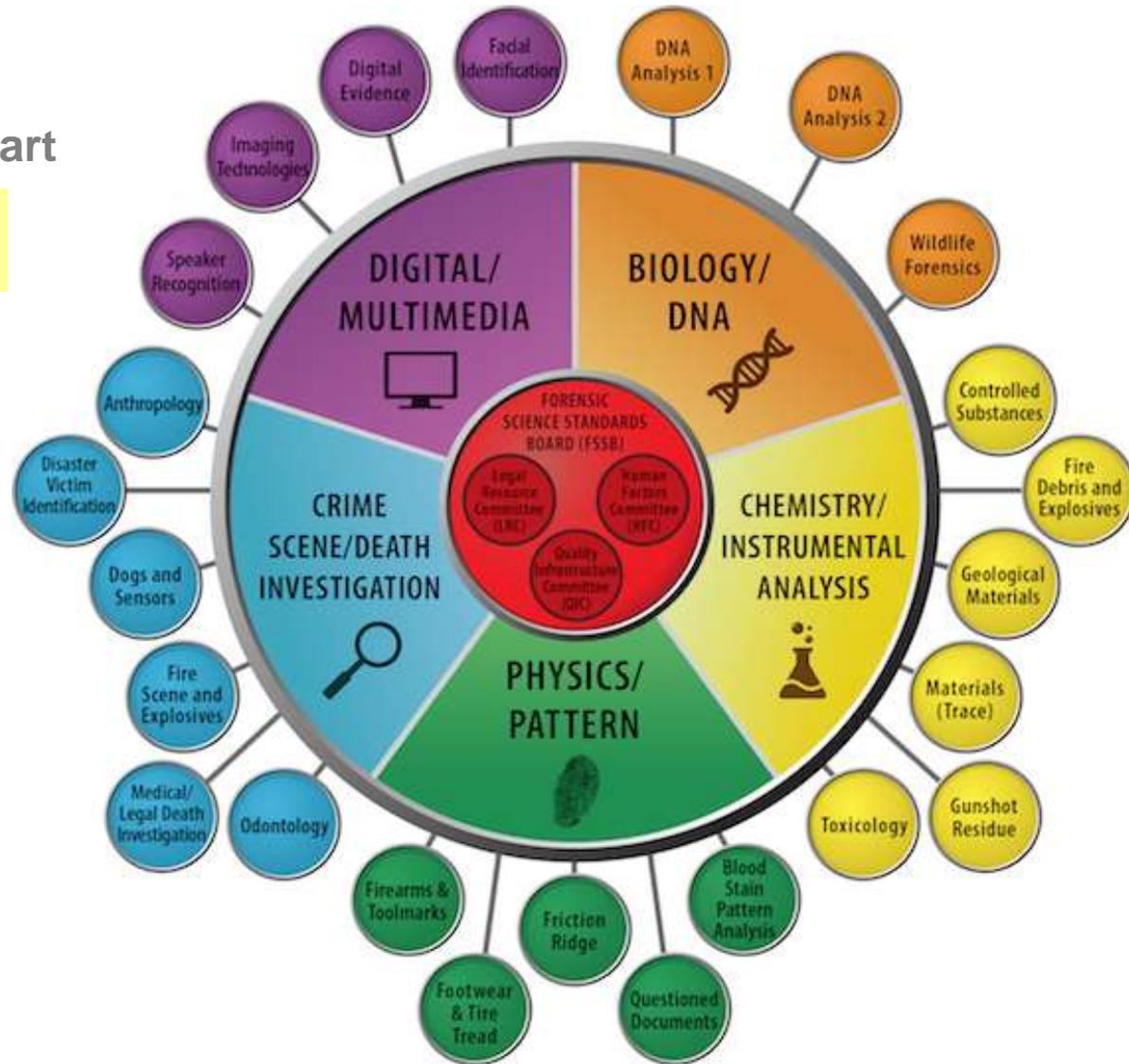
Organization of Scientific Area Committees

OSAC

Functional Organization Chart

Practice-focused

542 members and >1200 affiliates as subject matter experts participating in 24 subcommittees, 5 scientific areas, 3 resource committees (legal, quality, human factors), and 1 governing board (Forensic Science Standards Board)



<http://www.nist.gov/forensics/osac/index.cfm>

Initial membership
finalized Dec 22, 2014

Organization of Scientific Area Committees (OSAC)

June 26

Forensic Science Standards Board (FSSB)

July 16

Legal Resource Committee (LRC)

Quality Infrastructure Committee (QIC)

Human Factors Committee (HFC)

Sept 3

collaborative group of 542 forensic practitioners & other experts

Biology/DNA SAC

Chemistry/
Instrumental Analysis SAC

Crime Scene/
Death Investigation SAC

Digital/Multimedia SAC

Physics/Pattern Interpretation SAC

Bottom portion (subcommittee membership) announced Oct 29 & Dec 22, 2014

Biological Data Interpretation and Reporting Sub

Fire Debris and Explosives Sub

Anthropology Sub

Digital Evidence Sub

Bloodstain Pattern Analysis Sub

Biological Methods Sub

Geological Materials Sub

Disaster Victim Identification Sub

Facial Identification Sub

Firearms and Toolmarks Sub

Wildlife Forensics Sub

Gunshot Residue Sub

Dogs and Sensors Sub

Speaker Recognition Sub

Footwear and Tire Sub

Materials (Trace) Sub

Fire and Explosion Investigation Sub

Video/Imaging Technology and Analysis Sub

Forensic Document Examination Sub

Seized Drugs Sub

Medicolegal Death Investigation Sub

Friction Ridge Sub

Toxicology Sub

Odontology Sub

SAC = Scientific Area Committee
Sub = Subcommittee

>1200 additional applicants who can assist with task group efforts as OSAC affiliates

Understanding the OSAC Levels

Forensic Science Standards Board (FSSB)

- Set policy, rules, priorities for OSAC
- Manage OSAC Registry of Approved Standards and Approved Guidelines

Legal Resource, Quality Infrastructure, Human Factors Committees

- Provide advice across all forensic science and discipline committees

Scientific Area Committees

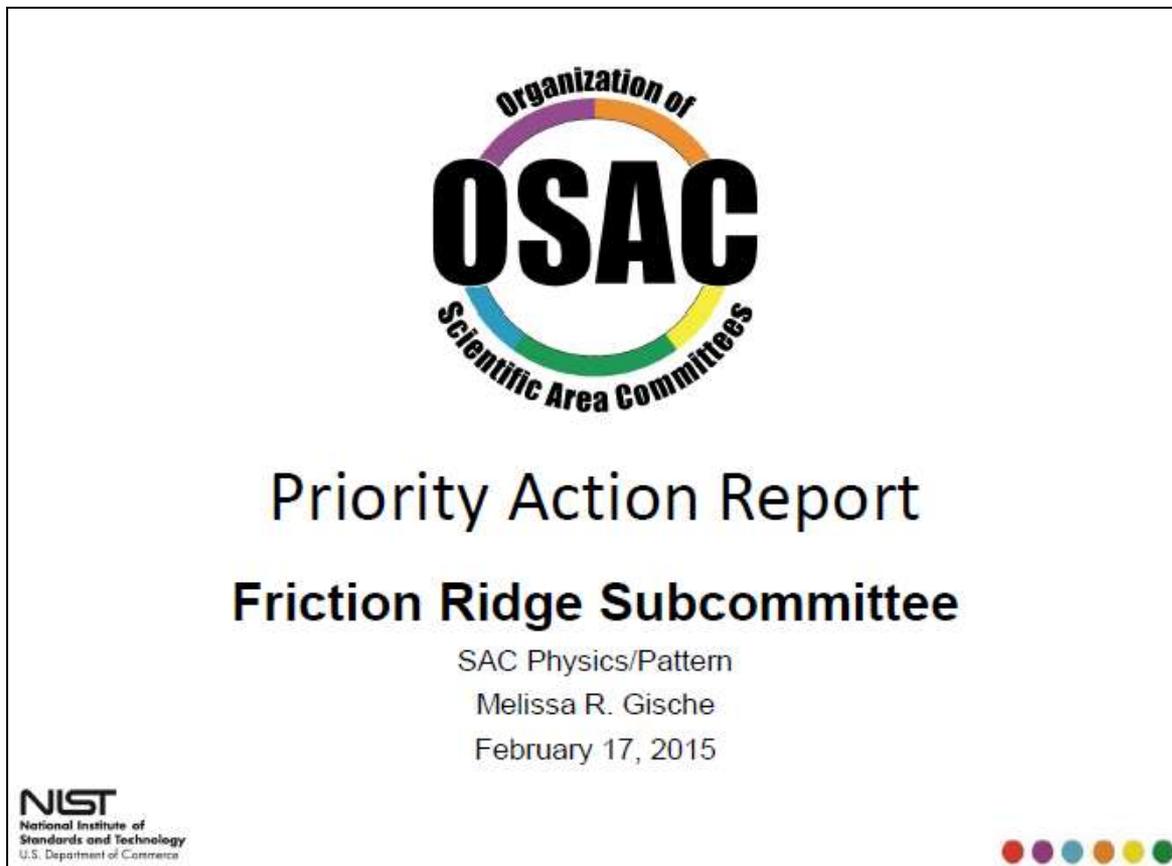
- Manage work within a scientific area (harmonize/leverage across related disciplines)
- Adopt and approve scientific area standards, (e.g., terminology, reporting requirements, conclusion statements)

Discipline Specific Subcommittees (Working Groups)

- Identify and develop (with an SDO or the canvass method) standards & guidelines for discipline

OSAC Scientific Area Committee Public Meetings held February 16-17, 2015 in Orlando, FL

1 of 30 presentations that can be downloaded



- This friction ridge subcommittee presentation contains 27 slides
- Reviews subcommittee leadership, membership, priority topics, and task groups

<https://workspace.forensicosac.org/kws/public>

How does NIST see NIJ fitting in relation to the new OSAC/NIST structure? How are the roles of NIST/NIJ distinct?

- **NIJ's relationship to OSAC:** No formal relationship currently exists but the potential exists to create ties (e.g., future Federal funding administered through NIJ might be linked to compliance with OSAC standards as part of accreditation)
- **Distinct roles of NIJ and NIST:**
 - **NIJ Office of Investigative and Forensic Sciences** improves the quality and practice of forensic science through innovative solutions that support research and development, testing and evaluation, technology, information exchange and the development of training resources for the criminal justice community
 - **NIST SPO Forensic Science Program** strengthens the practice of forensic science through collaborating and conducting research, facilitating documentary standards development, producing quality reference standards and databases, convening symposia and training workshops, coordinating inter-laboratory studies and informing interagency forensic science policy recommendations
- **NIJ** uses open solicitations to fund **extramural research**; **NIST** works directly with the forensic science community to determine needs and then makes internal funding decisions to perform **intramural research**

Has the NIJ/NIST partnership informed the structure or mission of the OSAC effort? If so, how?

- OSAC effort is building on Scientific Working Groups (SWGs) formerly funded by NIJ, FBI, DEA and other agencies
- NIST/NIJ held a joint meeting on June 18, 2013 with the SWG chairs that assisted in the development of the eventual OSAC framework
- NIJ funded research could provide supporting data to validate or contradict existing guidelines, which would trigger re-drafting by OSAC

Listing of Scientific Working Groups (SWGs) as of 2013

	Scientific Working Group (SWG)	Topic (Forensic Discipline)	Start	Sponsor	Website
1	SWG DAM	DNA	1988	FBI	swgdam.org
2	SWG MAT	Materials (Trace)	1992	FBI	swgmat.org
3	SWG FAST	Friction Ridge (Fingerprints)	1995	FBI	swgfast.org
4	SWG DRUG	Controlled Substances	1997	DEA	swgdrug.org
5	SWG IT	Imaging Technologies	1997	FBI OTD	swgit.org
6	SWG DOC	Document Examination	1997	FBI	swgdoc.org
7	SWG DE	Digital Evidence	1998	FBI OTD	swgde.org
8	SWG GUN	Firearms & Toolmarks	1998	FBI	swggun.org
9	SWG FEX	Fire Debris & Explosives	1998	NIJ	swgfex.org
10	SWG STAIN	Bloodstain Pattern	2002	NIJ	swgstain.org
11	SWG TREAD	Shoeprint & Tire Tread	2004	FBI	swgtread.org
12	SWG DOG	Dog & Orthogonal Detector	2004	FBI	swgdog.fiu.edu
13	SWG GSR	Gun Shot Residue	2007	NIJ	swggsr.org
14	SWG ANTH	Anthropology	2008	FBI	swganth.org
15	SWG TOX	Toxicology	2009	NIJ	swgtox.org
16	FISWG	Facial Identification	2009	FBI OTD	fiswg.org
17	SWG DVI	Disaster Victim Identification	2010	FBI	swgdvi.org
18	SWG MDI	Medicolegal Death Investigation	2010	NIJ/FBI	swgmdi.org
19	SWG GEO	Geological Materials	2011	USACIL	swggeo.org
20	SWG WILD	Wildlife Forensics	2011	USFWS	wildlifeforensicscience.org/swgwild
21	SWG SPEAKER	Voice Analysis	2012	FBI	swg-speaker.org

Will the OSAC make recommendations on research needs in their areas?

- **Yes** – in the process of reviewing draft standards and guidelines, it is possible that each Scientific Area Committee will discuss research needs or discover gaps within the 24 forensic science disciplines currently represented in OSAC
- Standards development by members of OSAC will highlight research needs and **inform the forensic science community in ways that NIJ will have the opportunity to ingest and use in setting research priorities to fund**

If OSAC makes such recommendations, how will research requests from the OSAC and NIST be funded?

- While the focus of OSAC is on standards development not on research or research priorities, NIST is open to finding a way to have **the research needs identified by OSAC summarized in an annual report** as well as part of regular information sharing that occurs from public SAC meetings
- Other opportunities to connect OSAC acquired knowledge with future NIJ research agendas can certainly be explored

Will OSAC consider the results of any recent NIJ R&D efforts when setting standard practices?

- It is expected and we hope so!
- OSAC has ~20% researchers in each subcommittee to help address this question

Are there any NIJ research projects that have (or has the potential to) change practice in forensic science?

- **Past:** new DNA methods for damaged samples using miniSTRs (NIST/NIJ interagency agreement)
- **Present:** NIST/NIJ Latent Print Examination and Human Factors report (NIST/NIJ interagency agreement)
- **Future:** Cadre Research TopMatch-GS 3D system
 - NIJ awards: 2012-DN-BX-K058, 2013-R2-CX-K005, 2014-DN-BX-K012
 - Website for more information: <http://www.cadresearchlabs.com/?q=forensics>

We will defer to Gerry LaPorte from NIJ for other examples

New NIST-developed “miniSTR” Assays Enable Improved Recovery of Damaged DNA

At the request of the New York City Office of Chief Medical Examiner Forensic Biology Laboratory, a new DNA test (named “miniSTRs”) was developed at NIST to help identify victims of the WTC 9/11 terrorist attacks. The technology was transferred to Bode Technology Group and used on 20,000 badly damaged bone fragments recovered from WTC – yielding 20 % more information on the badly damaged DNA. miniSTRs were later commercialized by Applied Biosystems into the MiniFiler kit and they have made millions off of these kits.

miniSTRs enabled analysis of Romanov bone fragments discovered in 2007 to help identify the two missing children

Coble et al. (2009) Mystery solved: the identification of the two missing Romanov children using DNA analysis. *PLoS One*, 4(3), e4838

miniSTRs enabled analysis of King Tut's family DNA

in 2009 from mummified remains more than 3500 years old

Hawass et al. (2010) Ancestry and pathology in King Tutankhamun's family. *JAMA*. 303(7): 638-647

New miniSTRs adopted as part of new core markers in Europe in 2009 and soon to be in U.S. (FBI moving to 20 required markers in 2017)

Coble & Butler (2005) Characterization of new miniSTR loci to aid analysis of degraded DNA. *J. Forensic Sci.* 50, 43-53
Gill et al. (2006) The evolution of DNA databases – recommendations for new European STR loci. *FSI*, 156, 242-244
Hares (2012) Expanding the CODIS core loci in the United States. *Forensic Sci. Int. Genet.* 6, e52-54, e135

U.S. is Moving to 20 Core Loci

Forensic Science International: Genetics 17 (2015) 33–34

Contents lists available at ScienceDirect

Forensic Science International: Genetics

journal homepage: www.elsevier.com/locate/fsig



Locus

CSF1PO

D3S1358

D5S818

D7S820

D8S1179

D13S317

D16S539

D18S51

D21S11

FGA

TH01

TPOX

vWA

D1S1656

D2S441

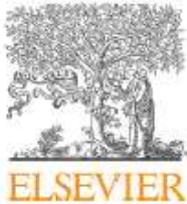
D2S1338

D10S1248

D12S391

D19S433

D22S1045



Letter to the Editor

Selection and implementation of expanded CODIS core loci in the United States

“The CODIS Core Loci Working Group selected a consortium of 11 CODIS laboratories...these laboratories performed validation experiments...

With the assistance of the National Institute of Standards and Technology (NIST), the data generated through these validation studies were compiled, reviewed and analyzed.”

Red is for original CODIS Core 13 Loci.

Blue is for new additional CODIS Core Loci.

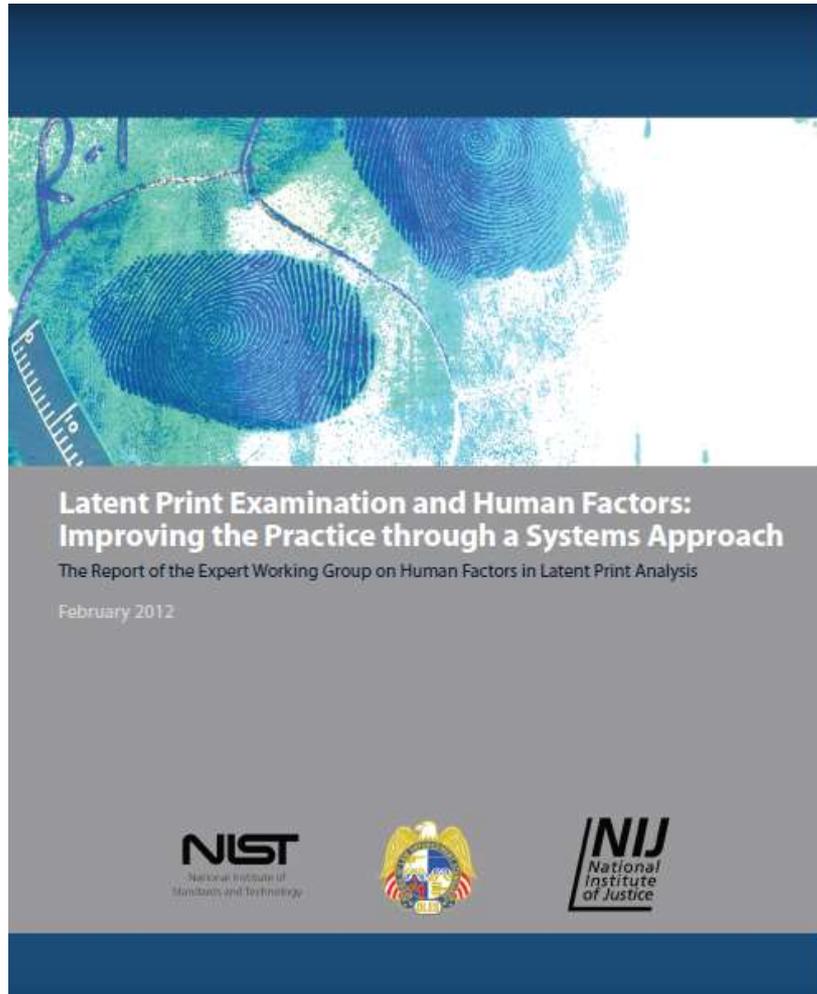
Three major reasons for expanding the CODIS core loci in the United States

D.R. Hares (2012) *Forensic Sci. Int. Genet.* 6(1):e52-e54

- **To reduce the likelihood of adventitious matches** as the number of profiles stored at NDIS continues to increase each year
- **To increase international compatibility** to assist law enforcement data sharing efforts
- **To increase discrimination power to aid missing persons cases**

An Example of Direct Impact to Practice: Latent Print Examination and Human Factors Report

NIJ award to NIST: 2008-DN-R-121 and 2010-DN-R-7121



- February 2012 report from the Expert Working Group on Human Factors in Latent Print Analysis
- Input from **64 contributors** and **11 reviewers**
- Provides **34 recommendations** and **detailed process maps**
- **Has directly influenced change in laboratory processes and reports from the FBI Laboratory and others**

12 MB pdf file (249 pages) available from

<http://www.nist.gov/forensics/publications.cfm>

Other Recent NIST/NIJ Publications

<http://www.nist.gov/forensics/publications.cfm>

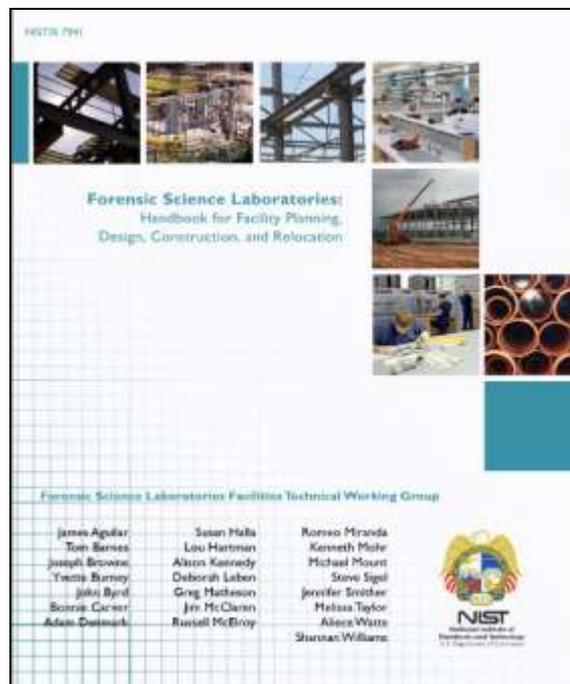
- Biological Evidence Preservation Handbook (2013)
- Forensic Lab Construction (2013)
- Crime Scene Investigation (2013)

**Free pdf documents
available**



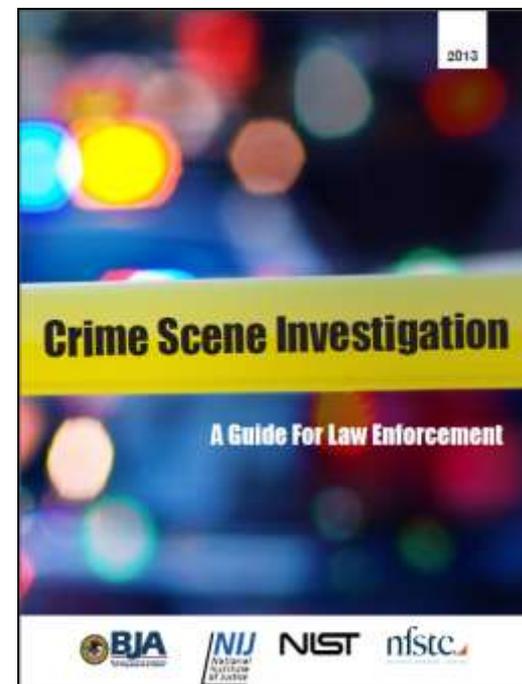
73 pages

NIJ award to NIST: 2010-DN-R-7121



98 pages

NIJ award to NIST: 2010-DN-R-7121



180 pages

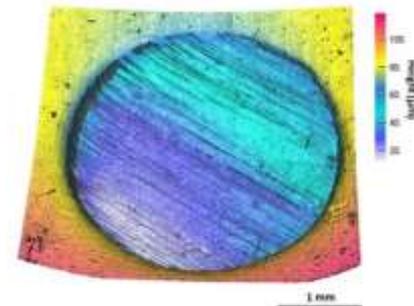
NIJ award to NFSTC: 2007-MU-BX-K008

Recent Forensic Conferences Held at NIST in Collaboration with NIJ



January 26-27, 2015

**Forensic Optical
Topography Meeting**
(with NIJ and RTI International)



March 17-18, 2015

Summarize the Mission, Goals, and Work of the National Commission on Forensic Science

- *See following slides*

National Commission on Forensic Science (NCFS)

www.justice.gov/ncfs

Policy-focused

NCFS Leadership

National Commission on Forensic Science Home

Members
Meetings
Subcommittees
Press Room
Contact the Commission



In 2013, the Department of Justice (DOJ) established the National Commission on Forensic Science, in partnership with the National Institute of Standards and Technology (NIST), to enhance the practice and improve the reliability of forensic science. This unique partnership draws upon each agency's core strengths to promote scientific validity, reduce fragmentation, and improve federal coordination of forensic science.

The Commission is co-chaired by Deputy Attorney General James M. Cole and NIST Acting Director and Acting Under Secretary of Commerce for Standards and Technology, Willie E. May. Nelson Santos, Deputy Assistant Administrator for the Office of Forensic Sciences at the Drug Enforcement Administration, and John M. Butler, Special Assistant to the NIST Director for forensic science, serve as vice-chairs. Brette Steele, Senior Advisor on Forensic Science and Senior Counsel to the Deputy Attorney General serves as the Designated Federal Officer and Robin Jones, Consultant within the Department of Justice, serves as Program Manager.

The Commission includes federal, state and local forensic science service providers; research scientists and academics; law enforcement officials; prosecutors, defense attorneys and judges; and other stakeholders from across the country.

GENERAL INFORMATION NATIONAL COMMISSION ON FORENSIC SCIENCE

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Sally Q. Yates
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NIST Co-Chair



Nelson A. Santos
Vice-Chair (DOJ)



John M. Butler
Vice-Chair (NIST)

31 voting and 8 *ex-officio* members

Last meeting (5th): January 29-30, 2015

Next meeting (6th): April 30-May 1, 2015

Timeline for Commission Activities

- Announcement at AAFS 2013 meeting (February 21, 2013)
- Commission charter filed (April 23, 2013)
- Commission membership named (January 10, 2014)

Meetings held so far (first-term of Commission):

- *First* meeting (February 3-4, 2014)
- *Second* meeting (May 12-13, 2014)
- *Third* meeting (August 26-27, 2014)
- *Fourth* meeting (October 28-29, 2014)
- *Fifth* meeting (January 29-30, 2015)

Future meetings planned:

- *Sixth* meeting (April 30-May 1, 2015)
- *Seventh* meeting (August 10-11, 2015)
- *Eighth* meeting (December 7-8, 2015)
- *Ninth* meeting (March 21-22, 2016)
- *Tenth* meeting (June 20-21, 2016)

**Federal Advisory
Committees exist on a
2-year renewal cycle**

The existing
Commission *charter*
expires April 23, 2015

**DOJ plans to renew
charter (and include
digital evidence)**

NCFS Meeting 5 Topics

January 29-30, 2015

- **Subcommittee Reports & Work Product Discussion**
 - **Four final work products** discussed; **three were approved**
- Update on Bureau of Justice Statistics law enforcement agency forensic unit survey plans (Speaker: Erica Smith)
- **Panel on** documentary standards
 - Speakers: Gordon Gillerman, Warren Merkel, Karen Reczek
- **Panel on** judicial training
 - Speakers: Katheryn Yetter, Judge Jeremy Fogel, Judge Mark Atkinson
- **Presentation on** accreditation and certification within the MDI community
 - Speaker: Steven Clark

Current NCFS Subcommittees

<http://www.justice.gov/ncfs/subcommittees>

where much of the Commission work occurs...

NCFS Subcommittee	# Commissioners	# Non-Commissioners
1. Accreditation & Proficiency Testing	7	15
2. Human Factors & Cognitive Bias	5	13+1
3. Interim Solutions	12	2
4. Medico-legal Death Investigation	6	9
5. Reporting & Testimony	13	8
6. Scientific Inquiry & Research	12	3
7. Training on Science & Law	8	6

Most Commissioners are on multiple subcommittees

57 non-Commissioners contributing to the process

Subcommittee products are discussed and voted on by the full Commission prior to be recommended to the Attorney General

Anything else you want to share about the current R&D needs of the forensic science community?

From our perspective, some current primary challenges in forensic science:

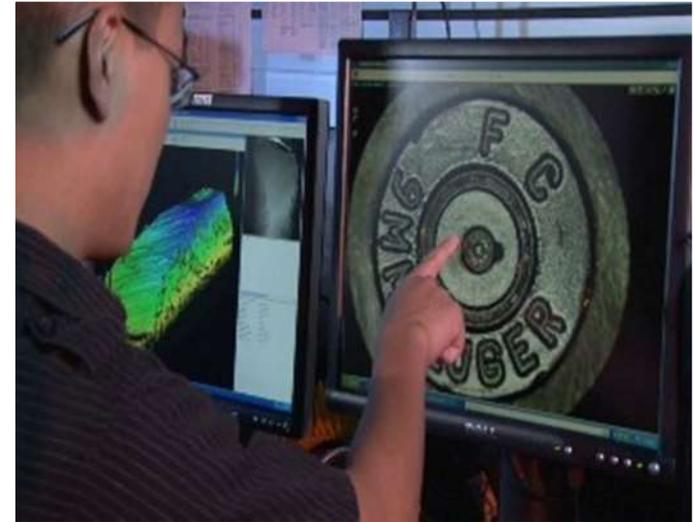
1. DNA mixture interpretation
2. Growth in mobile & computer forensic needs
3. Keeping up with emerging synthetic drugs
4. Quantitative fingerprint evaluations and applying relevant statistics to other forms of pattern evidence

More critical thinking is needed in forensic science at the bench level and in management

NIST Forensic Science Center of Excellence

Focus and Status

- This new Center of Excellence will focus on **developing probabilistic methods** to support the forensic science disciplines **with a focus on Pattern Evidence and Digital Evidence**
- Center will also focus on **developing training tools for practitioners and non-practitioners**
- Solicitation was open from August 19 to December 11, 2014
- **NIST plans to make the award soon (Spring 2015)**
- For more information, see <http://www.nist.gov/coe/forensics/>



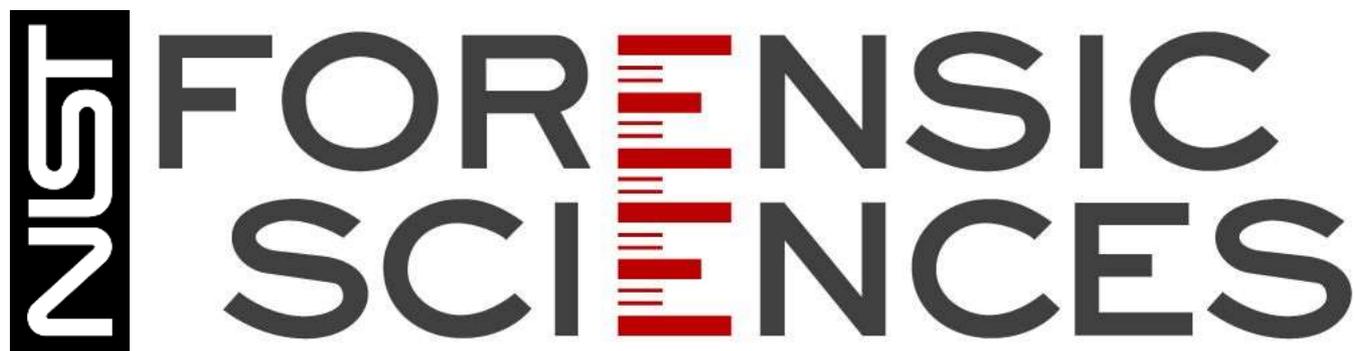
Credit: NIST



Credit: FBI

National Commission on Forensic Science (NCFS):
www.justice.gov/ncfs

Organization of Scientific Area Committees (OSAC):
www.nist.gov/forensics/osac/index.cfm



www.nist.gov/forensics

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